

WHAT IS CLAIMED IS:

1. A mobile telecommunication apparatus comprising:

- an antenna;
- a receiving front end coupled at an input end to said antenna;
- a baseband-signal processing circuit coupled to an output end of said receiving front end; and
- a power amplifier module coupled at an output end to said antenna and coupled at an input end to said baseband-signal processing circuit,

wherein said power amplifier module comprises:

- a bias circuit to produce an idling current; and
- a power amplifier of which gain is controlled by said idling current produced by said bias circuit, and

wherein effects of changes of control voltage and ambient temperature of said power amplifier module can be removed by a first detector in said bias circuit to detect changes of the control voltage and a second detector in said bias circuit to detect changes of the ambient temperature.

2. The mobile telecommunication apparatus according to claim 1, wherein said bias circuit further comprises a differential circuit to make error amplification with said first detector provided to perform as a standard voltage source for ambient-temperature detection by said second detector and said second detector provided to perform as a standard voltage source for control-voltage detection by said first detector.

3. The mobile telecommunication apparatus according to claim 1, wherein said power amplifier module further comprises:  
a first matching circuit to apply an input signal to said power amplifier; and  
a second matching circuit to apply an output signal of said power amplifier to an output terminal of said power amplifier module.

4. The mobile telecommunication apparatus according to claim 2, wherein said power amplifier module further comprises:  
a first matching circuit to apply an input signal to said power amplifier; and  
a second matching circuit to apply an output signal of said power amplifier to an output terminal of said power amplifier module.

5. The mobile telecommunication apparatus according to claim 3, wherein said bias circuit, said power amplifier, said first matching circuit and said second matching circuit are monolithically mounted on a circuit board.

6. The mobile telecommunication apparatus according to claim 4, wherein said bias circuit, said power amplifier, said first matching circuit and said second matching circuit are monolithically mounted on a circuit board.

7. A mobile telecommunication apparatus comprising:  
an antenna;  
a receiving front end coupled at an input end to said antenna;

a baseband-signal processing circuit coupled to an output end of said receiving front end; and

a power amplifier module coupled at an output end to said antenna and coupled at an input end to said baseband-signal processing circuit,

wherein said power amplifier module comprises:

a bias circuit to produce an idling current; and

a power amplifier of which gain is controlled by said idling current produced by said bias circuit,

wherein said bias circuit further includes an ambient temperature detector to detect changes of ambient temperature so that effects of changes of ambient temperature of said power amplifier module can be removed by the ambient temperature detector without using Schottky diodes.

8. The mobile telecommunication apparatus according to claim 7, wherein said bias circuit further includes a control voltage detector to detect changes of the control voltage so that effects of changes of control voltage of said power amplifier module can be removed by the control voltage detector.

9. The mobile telecommunication apparatus according to claim 8, wherein said bias circuit further comprises a differential circuit to make error amplification with said control voltage detector provided to perform as a standard voltage source for ambient-temperature detection of said ambient temperature detector and said ambient temperature detector provided to perform as a standard voltage source for control-voltage detection of said control voltage detector.

10. The mobile telecommunication apparatus according to claim 7, wherein said power amplifier module further comprises:

a first matching circuit to apply an input signal to said power amplifier; and

a second matching circuit to apply an output signal of said power amplifier to an output terminal of said power amplifier module.

11. The mobile telecommunication apparatus according to claim 4, wherein said power amplifier module has a plurality of power-amplifying transistors provided in series,

wherein said first matching circuit is connected to an input transistor of the plurality of said power-amplifying transistors in series, and

wherein said second matching circuit is connected to an output transistor of the plurality of said power-amplifying transistors in series.

12. The mobile telecommunication apparatus according to claim 11, wherein said bias circuit is coupled to each of said power-amplifying transistors.

13. The mobile telecommunication apparatus according to claim 4, further comprising a power-amplifying transistor,

wherein said first detector further comprises a voltage-dividing-resistor circuit to divide the control voltage,

wherein said second detector further comprises transistors in diode connection, the transistors in diode connection having substantially the same

structure as said power-amplifying transistor, the power-amplifying transistor and the transistors in diode connection constituting a current mirror,

wherein said idling current of said bias circuit is generated from a first resistive element provided in said bias circuit, between an input terminal of the control voltage and of said power-amplifying transistor, and

wherein said differential circuit of said bias circuit stabilizes the current passing through said resistive element by the error-amplifying performance of said differential circuit to stabilize the idling current.

14. The mobile telecommunication apparatus according to claim 13, wherein said transistors in diode connection of said second detector are in a configuration of a first transistor and a second transistor,

wherein a pair of said power-amplifying transistors are provided in a configuration of a third transistor and a fourth transistor in a Darlington connection, and

wherein at least a second resistive element is provided between the emitter of said third transistor and the base of said fourth transistor, and the input signal is fed through a coupling capacitance to the base of said fourth transistor.

15. The mobile telecommunication apparatus according to claim 14, wherein said differential circuit further comprises transistors which have substantially the same structure as said power-amplifying transistors,

wherein said bias circuit and said power-amplifying transistors are integrated into a single semiconductor integrated circuit, and

wherein said first and second matching circuits are mounted, as parts external of the semiconductor integrated circuit, on said printed circuit board.

16. The mobile telecommunication apparatus according to claim 15, wherein said transistors used in said bias circuit and said power-amplifying transistors are heterojunction bipolar transistors.

17. The mobile telecommunication apparatus according to claim 15, wherein said transistors used in said bias circuit and said power-amplifying transistors are metal-oxide-semiconductor field effect transistors.

18. The mobile telecommunication apparatus according to claim 13, wherein said voltage dividing circuit of said first detector has an external terminal through which the control voltage is input into said voltage dividing circuit.

19. The mobile telecommunication apparatus according to claim 4, wherein said power amplifier comprises a power-amplifying transistor and said bias circuit includes transistors in diode connection, which generate a base-emitter bias voltage of said power-amplifying transistor and which are formed with said power amplifying transistor on a first semiconductor chip,

wherein said bias circuits, except said transistors in diode connection for generating the bias voltage, are formed on a second semiconductor chip,

wherein said first semiconductor chip is constituted by one of GaAs- and SiGe-heterojunction bipolar transistors, and

wherein said second semiconductor chip is constituted by one of Si bipolar transistors and metal-oxide-semiconductor field effect transistors.

20. A mobile telecommunication apparatus comprising:

an antenna;

a receiving front end coupled at an input end to said antenna; a baseband-signal processing circuit coupled to an output end of said receiving front end; and

a power amplifier module coupled at an output end to said antenna and coupled at an input end to said baseband-signal processing circuit,

wherein said power amplifier module comprises:

a bias circuit for producing an idling current so that effects of changes of control voltage and ambient temperature can be removed;

a power-amplifying transistor of which gain is controlled by the idling current produced by said bias circuit;

a first matching circuit for feeding an input signal to the power-amplifying transistor; and

a second matching circuit for feeding an output signal of the power amplifier circuit to a load circuit,

wherein said bias circuit comprises:

a first means for detecting changes of control voltage of the module;

a second means for detecting changes of ambient temperature of the module;

and

a differential circuit for making error amplification with the first means serving as a standard voltage source for ambient-temperature detection and the second means serving as a standard voltage source for control-voltage detection, and

wherein said bias circuit, said power-amplifying transistor, and said first and second matching circuits are mounted on a printed circuit board.